Blue Ribbon Service

Form GSS-1053

Mower Cutter Bars–All Models

Maintenance and Repair

File: McCormick Hay Machines Service Manual

INTERNATIONAL HARVESTER COMPANY
180 NORTH MICHIGAN AVE. CHICAGO 1, ILLINOIS

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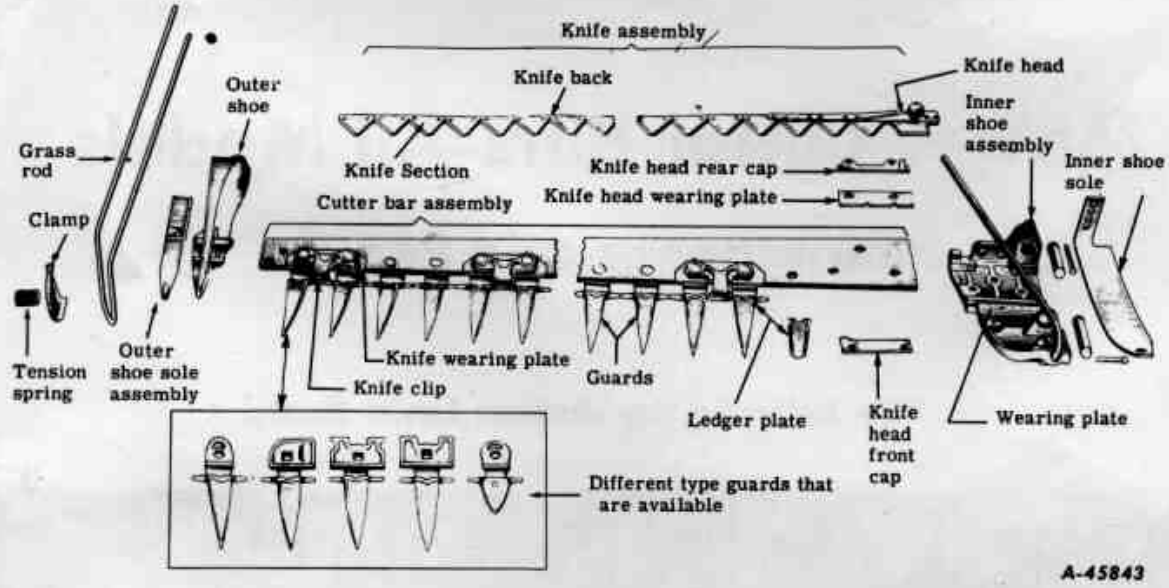


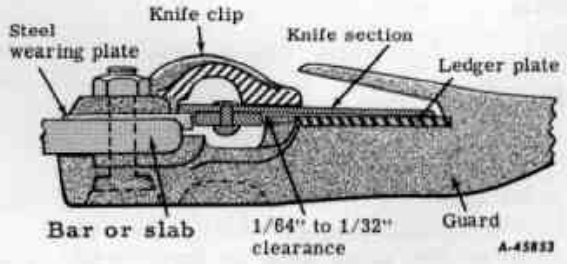
Illust. 1. Exploded view of a typical mower cutter bar.

INTRODUCTION

During the days when horses furnished the principal motive power for farm implements, the draft of a mower was an important factor. Because tired horses did less work, operators were more careful to maintain the cutting efficiency of their machines. Now, tractor mowers require only a small portion of the horsepower available from the tractor, therefore draft is no longer as noticeable a factor. There is a tendency for operators to continue using their tractor mowers without much regard to cutting efficiency as long as the mower does not plug excessively and as long as most of the hay is cut.

Increased acreages, mowing of pastures, higher tractor speeds, and the greatly increased power of modern tractors subject mowers to more severe usage than in the past. To maintain efficiency and avoid trouble and excessive expense, it is even more important now for operators to periodically check their machines for damage and to service them properly.

All McCormick cutter bars work in essentially the same manner and throughout the years the same relationship has been maintained between the guards, the knife, and all related parts. Guards must hold the ledger plates at the proper level and ledger plates must be level with each other and must be sharp. The knife must be straight, the sections sharp, and the wear plates must hold the knife at the proper relationship to the ledger plates. See Illust. 1 and 2.



Illust. 2. Schematic cross-section of cutter bar with MB-2041 guards, showing correct relation of parts.

GENERAL CHARACTERISTICS AND OPERATING PRECAUTIONS

The Bar or Slab

The bar has an upward curve built into it to offset the weight of the outer shoe. Constant lifting of the cutter bar with the bar plugged or caught on an obstruction will bend the bar downward. The wide use of hydraulic systems and the tendency of operators to transport their mowers at high speeds without utilizing the stay rod to support the bar have increased the possibility of it becoming bent. Once the bar has been bent downward and reshaped, the bar will bend much easier and usually will have to be replaced.

Operators should be warned to avoid lifting the bar, with the hydraulic system, with the bar excessively plugged. They also should be cautioned to use the stay rod during transporting.

Steel Wearing Plates

The wearing plates support the rear part of the knife, keeping the knife sections in contact with the ledger plates. When the plates become worn so that there is no more clearance between ledger plates, the knife section will tip up. This results in excessive clearance be-

tween sections and ledger plates which will cause ragged cutting. The plates are provided with slotted holes to allow adjustment as wear occurs. After all available adjustment has been taken up, the plates should be replaced.

The wearing plates should line up with each other to give the knife back a straight bearing along its entire length. Be especially careful to line up new plates properly. See Illust. 1.

Note: During manufacture, .015 inch shims are placed under the rear, knife head cap. A shim may be removed as wear develops, so that knife head clearance will not be excessive. Clearance of .015 inch at the knife head is desirable.

Knife Clips

Knife clips hold the knife sections down close against the ledger plates. In muddy conditions, excessive clearance between the clips and the knife will allow mud and juice to build up under the knife. This will hold it off of the ledger plates and result in poor cutting.

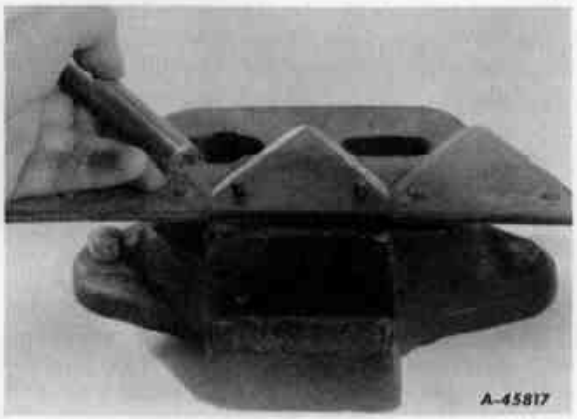
If clips become worn, allowing the knife to play up and down, and make poor contact with the ledger plates, the clips should be hammered down. Strike the clip at the front of the arch. If the knife is too tight, strike the holder on the back of the arch while the knife is under it.

Note: Where muddy clogging conditions prevail, many operators pour water on the cutter bar while it is operating. This allows the bar to clean itself.

Knife or Sickle

Knife or sickle are names commonly used to designate the moving part of the cutter bar which acts with the ledger plates to form a shear cut. The knife is usually equipped with smooth sections and the sickle is equipped with serrated sections. It is essential to have knife sections sharp and to replace those that are nicked or broken.

A knife back is quite pliable and care should be exercised in straightening one. A knife repair block with rivet set is available through the parts department. The block is for replacing sections and for riveting wrist pins. See Illust. 3.



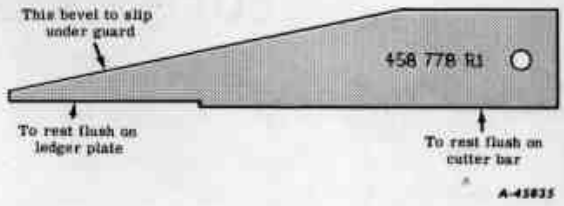
Illust. 3. Knife repair block and rivet set tool, M-2192.

Guards and Ledger Plates

The guards with the ledger plates divide the material being cut and protect the knife. The ledger plate acts as one half of the shear while the knife sections act as the other half. The sections and plates should fit together when the knife is in register with a clearance of 1/64 to 1/32 inch at the rear of the ledger plate. See Illust. 2. To insure a clean cut, ledger plates should be replaced when worn dull.

A special guard repair block, MA-2055, for holding any style guard during removal of rivet and replacing of plate is available through service parts. See Illust. 16.

Guards should be set so that all ledger plates are at the same level. A gage, 458 778 R1, is available to check guards to see whether they have been bent either up or down. Without a gage it is difficult to determine whether the guards have been bent or whether the knife is bent. See step 5, under the heading, "Cutter Bar Overhaul," for proper use of the gage shown in Illust. 4.



Illust. 4. Cutter bar guard gage.

CUTTER BAR INSPECTION CHECK LIST

1. Condition of guards and ledger plates

   (a) Guard points should be sharp
   (b) Ledger plates should be sharp
   (c) Guards should hold ledger plate at proper ledger plate-to-knife relationships (See Illust. 1)
   (d) Lips of all guards should be on the same straight line
   (e) All ledger plates should be on the same level

2. Condition of knife

   (a) Knife sections should be sharp and free of nicks
   (b) Knife must be straight across the back and straight as to level

3. Condition of bar slab

   (a) New bars have an upward curve built into them to offset the weight of the outer shoe assembly when in mowing position. This curve is important; make sure it is not bent downward

4. Wearing plates and knife holders

   (a) Wearing plates must support the knife as shown in Illust. 1
   (b) Wearing plates must be lined up straight, one to the other, so that the back of knife is held straight
   (c) Knife holders must hold knife down against ledger plates and still not bind

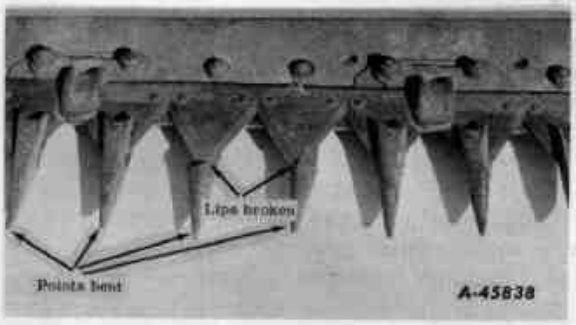
5. Adjustments for best performance

   (a) Cutter bar must have proper lead
   (b) Knife must have proper register
   (c) Cutter bar should be adjusted to proper tilt

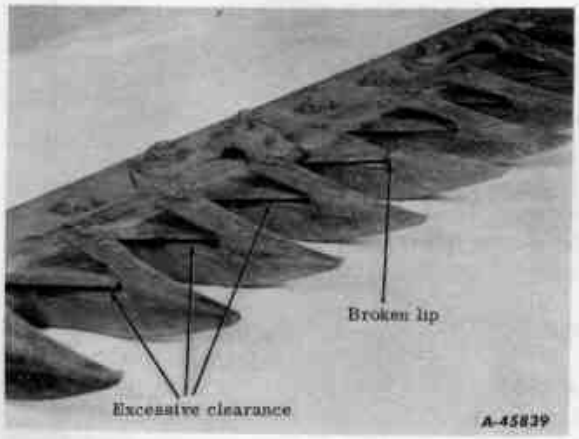
CUTTER BAR OVERHAUL

General Information

Illusts. 5 and 6 show a cutter bar used to mow cemeteries and not properly maintained. Note that clearance between the knife and ledger plate is excessive. The knife is tilted back due to excessive wear on the wear plates and too much clearance between the hold down clips and the knife. This clearance allows for a build up of dirt under the knife which further holds it off of the ledger plates. See Illust. 7 for view of same bar with the knife removed.

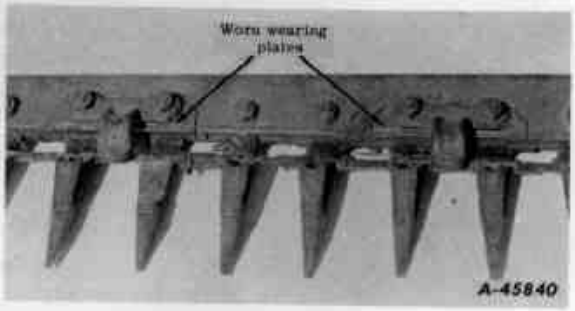


Illust. 5. A cutter bar that has been given hard use without adequate maintenance.



Illust. 6. Cutter bar that has too much clearance between knife and ledger plates to permit efficient cutting.

A number of the guards have been bent up as is always the tendency during use in rocky terrain or during rough usage. Unless the bent up guards are bent down so that the ledger plates are again all at the same level, installing new guards with proper ledger plate height can present a problem. The old guards will hold the knife up too high and the knife will strike the lips of the new guards and damage them. Illust. 5 shows guards which have been damaged in this manner.



Illust. 7. Cutter bar with knife removed shows signs of serious wear and damage due to lack of adequate maintenance.

Repair While Mower is Mounted

A satisfactory job of repairing the bar can be done with the mower mounted on the tractor, if proper procedures are followed.

<u>Be careful:</u> It is good practice to work on a cutter bar alone, as it is much safer.

1. First, lower the bar to the ground and remove the knife. The pitman may be easily and quickly removed from the knife head without a wrench by inserting a punch into the fork handle hole and forcing it away from the pitman as shown in Illust. 8. Then press on the outer end of the handle with your foot as shown in Illust. 9.

Illust. 8. Starting to release pitman from knife head.

Illust. 9. Pitman released by pressure on the punch that was inserted to provide added leverage.

2. Remove the knife toward the mower, by tapping on the knife head ball until it is withdrawn far enough to be removed by hand. See Illust. 10 and Illust. 11.

Caution: It is easy to cut your your fingers—use special care.

Illust. 10. Starting removal of knife from the cutter bar.

Note: Do not pound on the end of the end of the knife unless it is absolutely necessary to do so to remove it, as it is malleable and will peen easily. If it is necessary to pound on the end during removal, it should be ground or filed back to original thickness to prevent binding.

Illust. 11. Pulling the knife out of the cutter bar by hand.

3. Next, examine the condition of the bar itself to determine whether it has been bent or twisted. If the bar slab is

in good shape, remove all guards having broken lips or other damage.

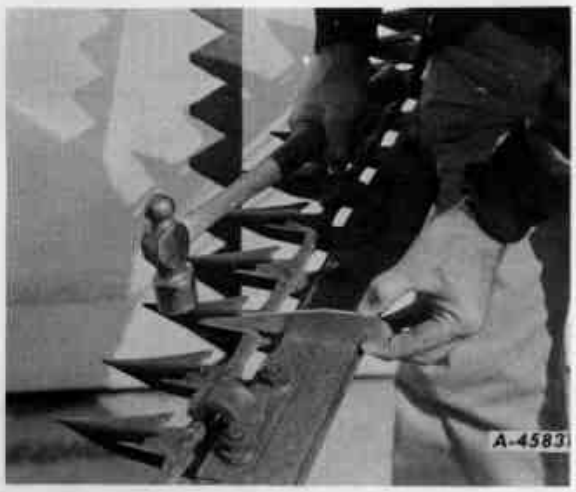
Note: The bar used in Illusts. 5, 6, and 7 had been bent downward by attempting to lift it while the outer shoe was caught on something.

4. Straighten the lips and points of the guards which can be straightened by hammering. Be sure to back up the point with another heavy hammer as shown in Illust. 12.

Illust. 12. Using two heavy hammers to straighten guard points.

5. Gauge all guards for proper ledger plate height, using the special gage, 458 778 R1, as shown in Illust. 4. Make certain that the body of the gage is resting flat on the bar and then swing the point of the gage toward the ledger plate surface. If the point will not clear the ledger plate with the body of the gage still contacting the surface across the width of the bar, the guard has been bent up. See Illusts. 13 and 14.

Illust. 13. Gage shows that there is excessive clearance at front of bar and in back of the ledger plate, indicating that the guard is bent up.



Illust. 14. Gage shows that ledger plate is at proper height—gage rests flush on both bar and ledger plate. Note spot where hammer blow is applied, when necessary.

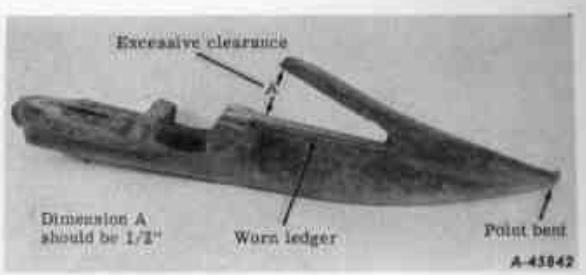
6. Bend guards, as necessary. Illust. 15 shows one method of bending the guards using a 1-1/4 inch pipe. A heavy hammer also may be used as shown in Illust. 14.

Apply the pressure at the heavy portion of the guard just forward of the front of the ledger plate. Use the gage and be careful not to bend the lips too low. The guards should fit to within 1/32 inch of the gage.

Illust. 15. Using a 1-1/4 inch pipe and the special gage to align bent guards.

Illust. 16. Using a hammer to pound down guards that have been bent up.

Note: If the 458 778 R1 gage is not available, a new knife with several new guards properly installed may be used as a guide when aligning the old guards.

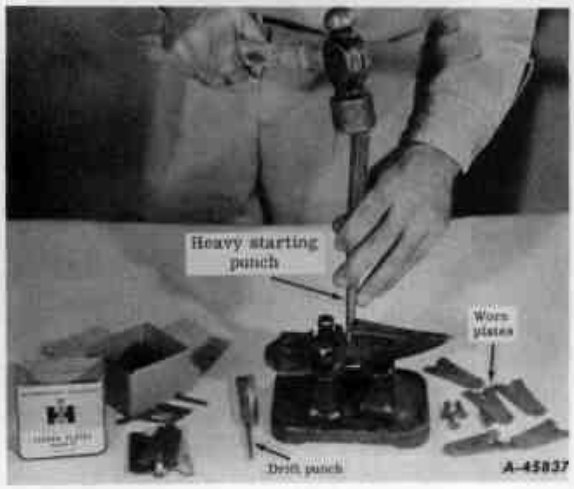


Illust. 17. A badly worn and bent guard. The lip is bent up so that clearance is excessive for effective operation.

7. Replace loose or dull ledger plates found by examination of guards after they have been aligned.

Note: Illust. 17 shows a dull ledger plate in a guard that has a dull point. Also note the excessive lip height. Repair is not difficult if correct tools are used. The guard repair block, MA-2055, shown in Illusts. 18 and 19 is essential and may be obtained from the Parts Department.

Important: Use a heavy starting punch with an end the same size as the rivet. Two heavy blows are sufficient to start the rivets so that they may be driven out with a drift punch. See Illust. 18.



Illust. 18. Starting removal of a ledger plate from a guard held by the guard repair block, MA-2055.

Caution: When replacing the ledger plates make certain that they are seated properly and riveted securely. See Illust. 19. The head of the countersunk rivet should be flush with the ledger plate. The outer shoe also contains a ledger plate secured by two rivets which may be replaced.

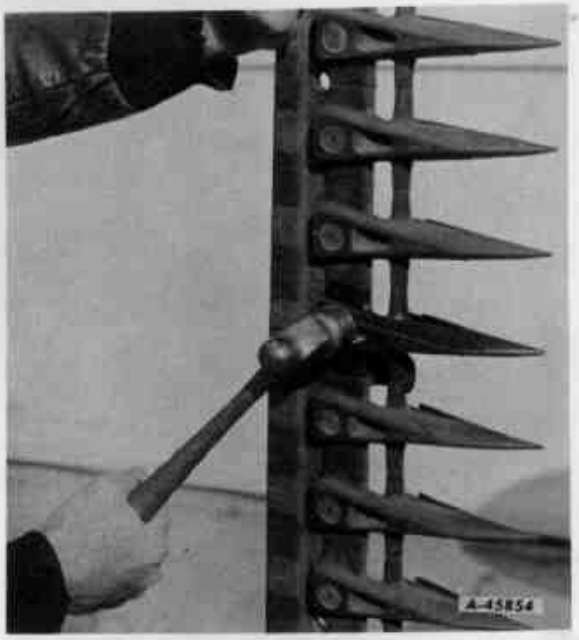
Illust. 19. Using guard repair block to rivet a new ledger plate in place.

8. Replace guards on the bar making certain that they are seated properly, with no dirt on either the bar or the guard pad.

Note: The MB-2041 guard has a slight radius to fit the contour of the front of the bar slab to prevent sideways shifting of guards. See guard section in this manual and Illust. 2. This tight fit requires that the guard be seated properly.

Important: Draw the nut up tight and then give the pad section of the guard at the bolt head several sharp hammer blows, as shown in Illust. 20, then retighten the nut. If there are any burrs or feather edges on the pad section this method will peen them to allow for a snug fit. Recheck the guards with the gage.

9. Sharpen the guard points, as shown in Illust. 21.



Illust. 20. Seating a new guard with a hammer blow at the pad section.

Illust. 21. Sharpening guard points with a file.

10. Replace the hardened steel wear plates and clips, if they are worn as much as half the thickness of the plate.

Note: It is important that wear plates hold the back of the knife up so that the ledger plates and knife sections contact with a shearing action.

Important: Replace all of the wearing plates at the same time so that they will present a uniform height for carrying the knife when installing all new ones. Align them all against the edge of the bar so that they give the maximum room for the knife to work and are all in a straight line. Illust. 22 shows the clips being driven back so that the clips and wear plates will be as far back as their adjustments allow.

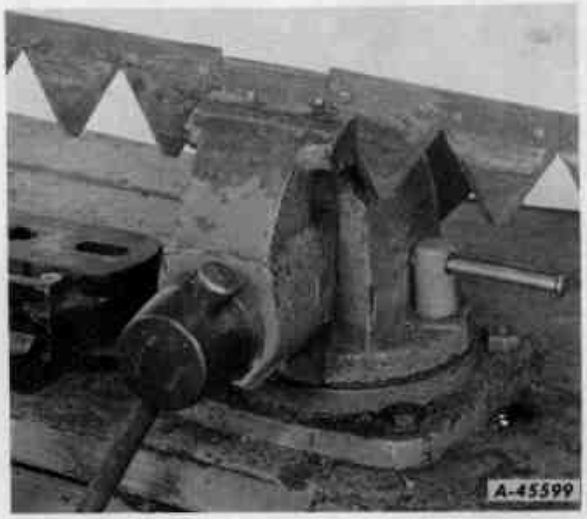
Caution: Be careful when driving the clips; the hardened wear plates can easily be cracked.

Illust. 22. Setting back the clips and wearing plates for maximum knife clearance.

11. Service the knife to assure that it is perfectly flat and also straight across the back. Make sure the head of the knife is straight so that when the wearing surface of the head is on its wear plate, all the sections will contact the ledger plates.

a. First, remove all broken, nicked, or dulled sections, by clamping them lightly in a vice and driving down on them with a heavy hammer to shear the rivets, as shown in Illusts. 23 and 24.

Illust. 23. Strike back of knife section with a heavy hammer as first step in removal.



Illust. 24. Hammer blow has sheared rivets holding section to knife back.

b. Be careful not to bend the knife while replacing sections, and then check the straightness across the back.

Note: Illust. 25 shows the knife repair block, M-2192, being used during straightening. The knife is very pliable and little effort is required to bend it.

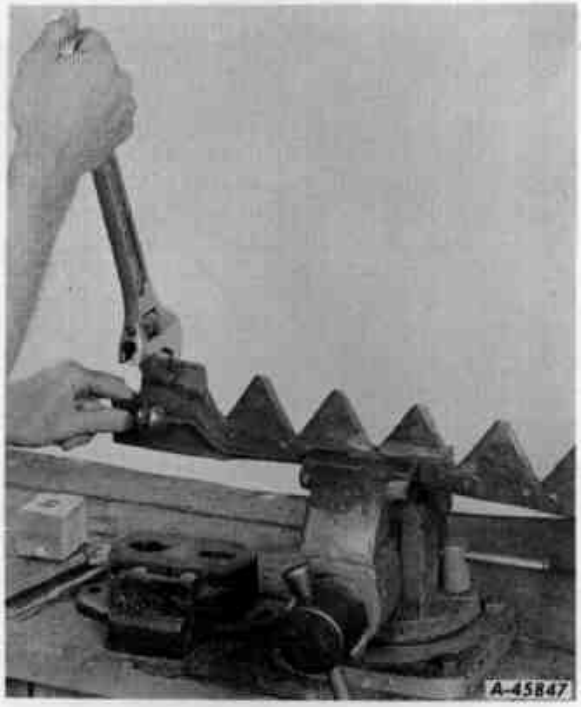
Illust. 25. Simple hand straightening of the knife using the knife repair block.

c. After straightening the knife across the back, replace the missing sections, but do not mix heavy and light sections.

Note: The heavy sections require a 14751 R1 rivet, 9/16" long and the regular sections require 12779 R1 rivet, 17/32" long. If the rivets used are too long, difficulty may be experienced with clearance and also with getting them riveted tightly. Knife head MA-999 is used with heavy sections and knife head MC-139 with regular sections. Use the riveting set M-2192 for riveting sections. See Illust. 3.

Illust. 26. Using knife straightening fixture to assure correct level of the sections.

d. When sections are replaced, straighten the knife for level. See Illusts. 26 and 27.



Illust. 27. Giving a bent knife head a slight twist to make the wearing portion of the head parallel with the knife sections.

Note: Sections that are not level can be straightened by striking them on the soft, center portion with a hammer.

Caution: Do not strike sections on their hardened, outer edges, as they will break.

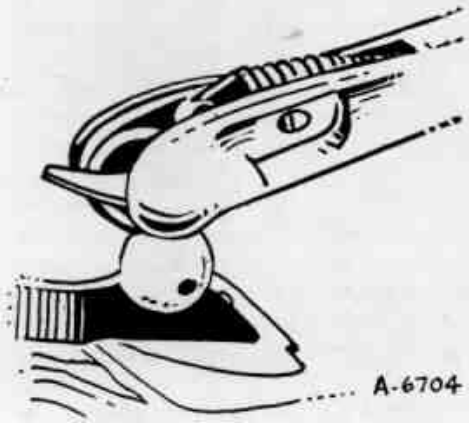
12. After reconditioning the knife and with the guards, wear plates, and clips properly serviced, lower the bar to the ground and replace the knife. Oil the knife and contacting points generously as it is being inserted.

13. When the knife is replaced, set the height of the clips to .015 inch above the knife sections, with the knife held down.

Note: Use a .015 inch shim as a feeler gage and hammer the clips down to this height. See Illust. 28.

Illust. 28. Hammer clips down to correct height above the knife.

14. Press the fork handle of the pitman between the straps and hold them over the knife head ball as shown in Illust. 29, then press the pitman down until the straps partly close the ball. Now, fold the handle back against the pitman.



Illust. 29. Attaching pitman to knife head.

Overhaul with Bar Assembly Removed

For a complete servicing of the cutter bar it is desirable to remove the complete assembly from the mower and do the work in a suitable shop. For most economical and convenient work a number of bars requiring overhaul should be lined up on saw horses or other suitable supports.

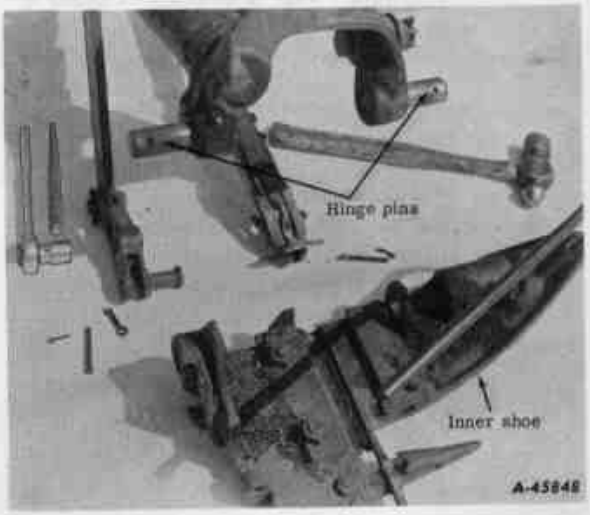
Removing the Cutter Bar

1. Lower the cutter bar to the ground. Disconnect the pitman and remove the knife.

2. Disconnect the gag lever at the outer end by removing the cotter and pin.

3. Remove cotters, retaining pins and hinge pins from the inner shoe. This will free the bar. See Illust. 30.

4. Place the cutter bar on suitable supports where you can work on it.



Illust. 30. Disassembly to free the cutter bar from the mower.

Overhaul Procedure

Service the various units and components of the cutter bar as described in the previous paragraphs on repairing the

bar while mounted on the tractor. The following items can be used as a check list of the procedural steps.

1. Check the bar for bends or twists and, if either condition exists, the bar slab should be replaced.

2. Remove all broken and badly damaged guards and also guards with dull ledger plates.

3. Replace ledger plates as necessary, sharpen guard points, and then replace the guard on the bar.

4. Check ledger plate heights with the gage, 458 778 R1, and bend guards as necessary. The rear tip of the guard lip should be only one-half inch above the level of the top of the ledger plate. See Illust. 16.

5. Replace excessively worn knife clips or wearing plates.

6. Service the knife sections, knife back, and the knife head.

7. Insert the knife into the cutter bar assembly and adjust the clips to correct height.

8. Check for wear of frame parts that can effect lead of the cutter bar. Replace hinge pins, hinge pin bushings (if mower is so equipped), the hinge plate, or the inner shoe if worn excessively.

9. Make certain that the bolts holding the inner shoe to the bar are securely tightened. If it is necessary to remove these bolts for replacing the bar or inner shoe, the nuts should be staked at the time of reassembly.

FINAL ASSEMBLY AND ADJUSTMENT

Complete the assembly of the cutter bar and replace it on the mower assembly on the tractor. Procedure is the reverse of the removal steps. Make sure the cutter functions freely; then make such adjustments as are necessary to obtain correct knife register, cutter bar lead, and correct tilt, as explained below.

Knife Register

Turn the flywheel by hand until the knife is at the extreme end of its travel, at either end. At this point the knife sections should be directly centered on the ledger plates.

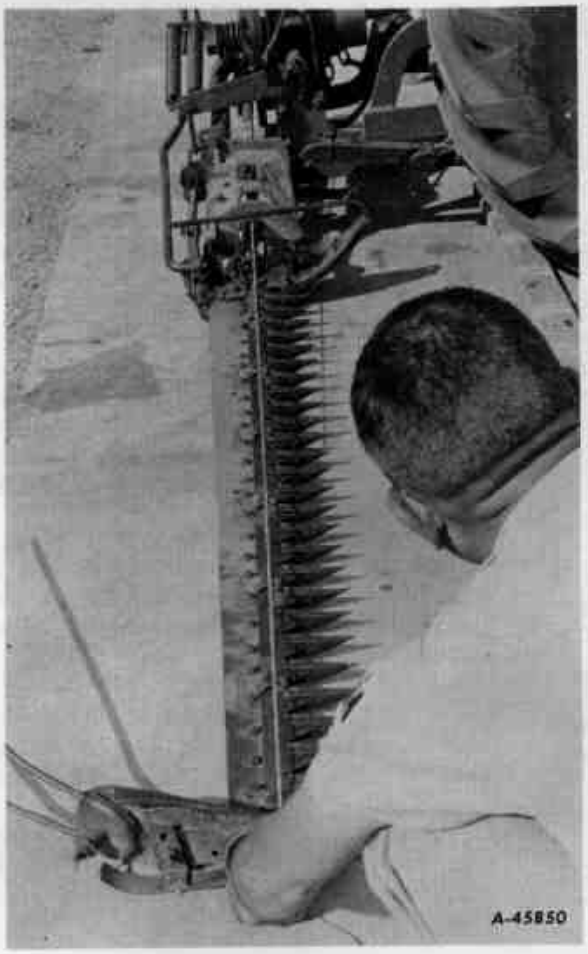
If the knife is not in correct register, cutting will be uneven, the knife will clog easily, and draft will be heavy. To correct improper register, see the Operator's Manual for specific mower.

Cutter Bar Lead

All mowers should have a certain amount of lead in the cutter bar; that is, the outer end should be ahead of the inner end under no load conditions to offset the backward strain produced by the pressure of cutting. The knife and pitman should also run in a straight line. If lead and proper knife to pitman alignment are not maintained, excessive wear of parts and ragged cutting will result.

Because of the speed and pressure of mowing with modern tractor mowers, as much as six inches of lead may be built into a mower. A minimum of 1-3/4" of lead must be maintained in a 7 foot bar.

To check for proper alignment of the pitman and knife use a string drawn tightly down the center of the pitman stick. Make sure to take up the play in



Illust. 31. Using a string to check alignment of the pitman and knife.

the parts, to the rear, as shown in Illust. 31. If these parts are not relatively straight, it can indicate presence of excessive wear in the hinge pins, hinge, or shoe. The bolts securing the inner shoe to the bar may also be loose.

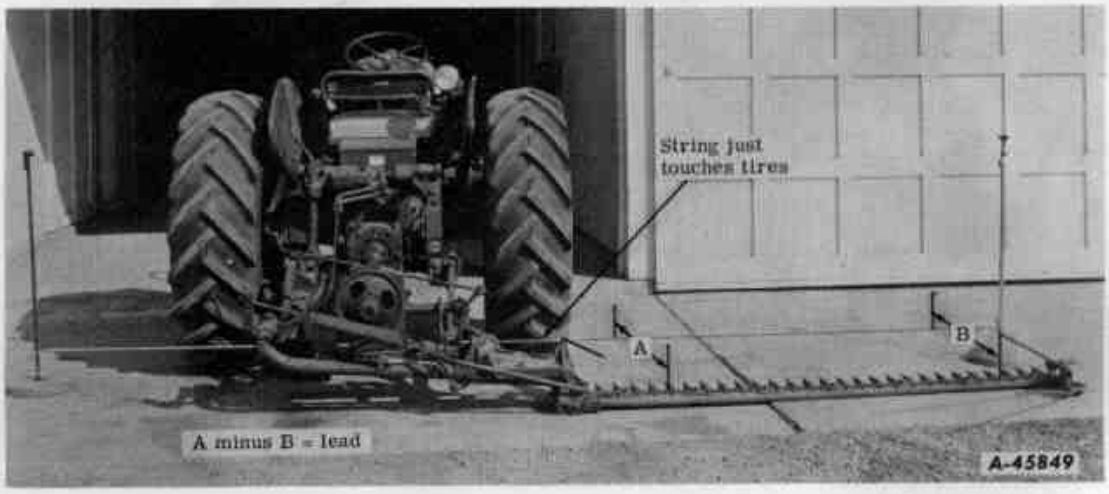
If the knife is allowed to run at an angle to the pitman, the pitman connection will flex and may break. Loss of lead will also be evident. Replace and tighten worn or loose parts as required.

To check lead, stretch a line across the rear face of the tractor wheels, parallel to the tractor rear axle as shown in Illust. 32; then measure from the line to the back of the knife at the outer and inner end of the bar. The difference between the two measurements is the lead of the bar.

See individual Operator's Manual for lead adjustments, if correct lead cannot be obtained through normal adjustments. Worn parts affecting this condition must be replaced.

Tilting Adjustment

Under certain conditions it may be desirable to change the tilt of the cutter bar. This raises or lowers the points of the guards in relation to the rear of the bar. See the adjustment instructions in the Operator's Manual for the particular mower involved.



Illust. 32. Method of measuring lead of a cutter bar.

GUARDS AND BAR ASSEMBLIES

There are a number of different guards available for special purposes or for general utility. You will also run across old versions of the presently manufactured guards, during servicing of mowers now in use by your customers.

This portion of the manual will help you to understand these differences and to explain the advantages of the various designs.

MD-989 mower guards are malleable iron, for three inch spacing, and are furnished as ordered for "all-around" cutting. This is an ideal guard for penetrating heavy crops, however, it will not withstand the abuse which heavy duty guards of more recent development will take.

MF-989 is a steel guard similar to the MD-989, three inch spaced, and built of a material which will withstand greater shock without breaking.

MB-2041-Z is the latest version of the previously produced MA-2041-Z and still earlier M-2041-Z heavy duty, malleable guard, three inch spaced, with a heavier, longer body and with serrated ledger plates. There has been some misunderstanding concerning the changes made when the guard was improved from M to MA and then from MA to MB. For your information, the following pictures and explanation show the improvements made.

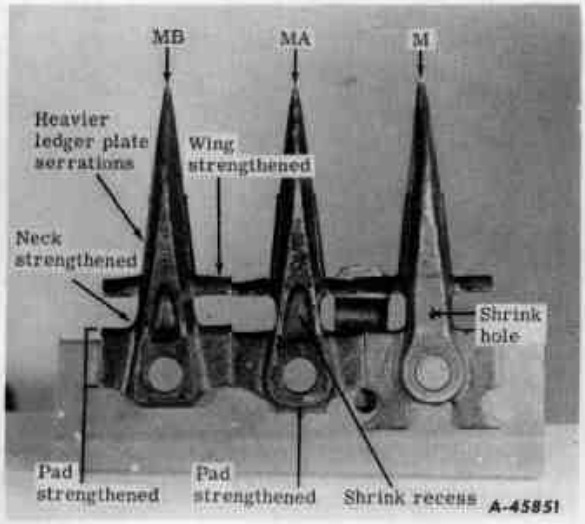
1. From M to MA involved addition of a shrink recess on the bottom side to replace the original shrink hole. This strengthened the guard. The pad section also was made stronger as shown in Illust. 33.

2. The change from MA to MB included several improvements, as explained below and as shown in Illusts. 33 and 34.

a. The cross-section of the wings was increased from 5/16 to 3/8" for greater strength and to prevent shifting.

b. The thickness of the mounting pad was increased from 1/8 to 3/16 inch for greater strength and to prevent shifting.

c. The thickness of the pad, where it fits against the leading edge of the bar or slab, was increased from 1/8 to 1/4 inch for increased strength.



Illust. 33. Top view comparison of guard development.

Illust. 34. Side view of latest model guard, MB-2041, showing principal improvements and ideal section-to-ledge plate contact.

d. The pad height was increased from 5/32 to 1/4 inch to give the pad better contact and support.

e. The cross-section of the neck of the guard was strengthened by increasing its size.

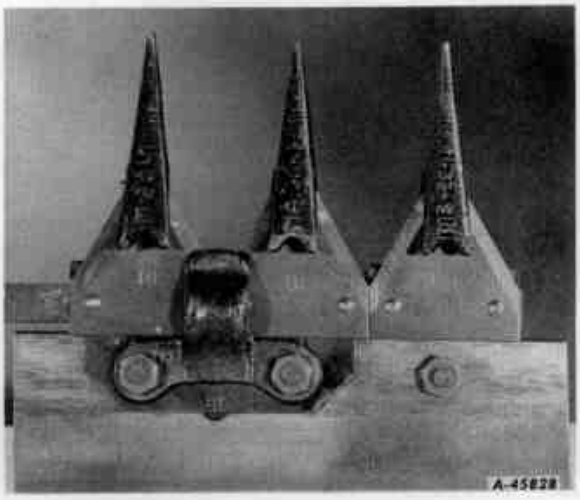
Note: The dimension from the front of the pad section to the bolt hole has remained the same on all three guards, as has the relationship between the pad section and the ledger plate.

DEMONSTRATOR KIT AND SPECIAL TOOLS

Section of Cutter Bar

A demonstration of the proper relationship of all of the cutter bar parts and of the improvements made in our guards over competitive guards can be made with a minimum of effort. Illust. 35 shows a short section of a cutter bar with three of the above mentioned guards mounted together with other related parts. A short section of the knife is also used. This kit can also be useful in explaining proper servicing of cutter bars.

The kit can be used to mount competitive guards to show the advantages of McCormick guards and as a selling aid for related cutter bar parts which should be replaced. It can also be used to demonstrate the use of the gage which can be sold to customers for aligning guards. See Illust. 3.

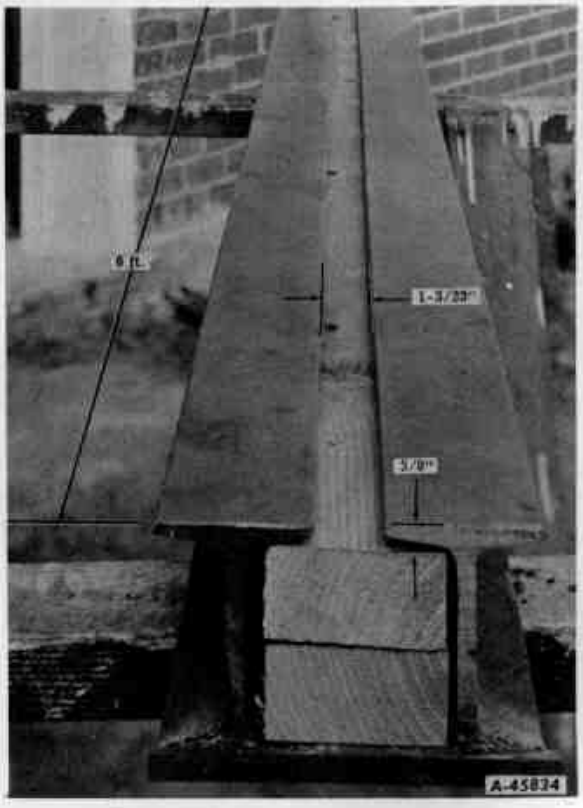


Illust. 35. Section of cutter bar prepared as a demonstration kit.

The demonstration bar can be made from a short section of an old bar which has been damaged or by cutting 12 inches off of a 7 foot bar to convert it to a 6 foot bar.

Knife Fixture

It will be very helpful and it is not difficult to produce a suitable fixture for overhauling mower bar knives locally. It will assure you that the knife is straight and level and that all sections are on the same level. See Illust. 36.



Illust. 36. Special fixture that can be made for handy servicing of the cutter bar knife.

A fixture can be made from hard wood that is covered with metal to provide better wearing qualities. Probably the easiest way is to use two 4 inch "I" beams joined across the ends and bottom with bars welded to the beams. The center is built up with hardwood 2 x 4's for better and simplified handling of the knife. See Illust. 36 for important dimensions.

It is most important that the two surfaces for supporting the knife sections be absolutely the same height and that the surfaces be smooth and true.

Service departments that do a considerable volume of knife sharpening or repair can hardly afford to be without a good knife fixture.

Guard Bolt Wrench

The nuts which secure the guard bolts to the cutter bar receive considerable wear and frequently are difficult to remove due to rounded edges. With the large number of guards on a single cutter bar, this can consume an excessive amount of the serviceman's time.

By welding a 3/4 inch, six point socket on a piece of rod or bar stock, as shown in Illust. 37, a valuable tool can be made locally to simplify cutter bar repair and overhaul. See Illust. 38.

Illust. 37. Locally constructed guard bolt wrench can save valuable time in service departments doing volume mower bar work.

Illust. 38. Tightening guard nuts on repaired cutter bar, using special wrench.

IT PAYS TO BE CAREFUL
FOR YOUR OWN SAKE!

Accidents can . . .

PAIN

LAME

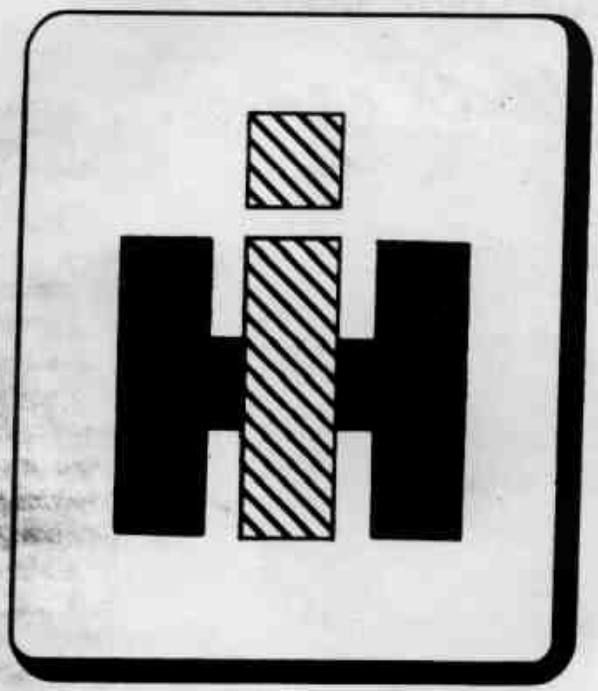
MAIM

and cost you money!

GREEN CROSS FOR SAFETY

AN EFFICIENT WORKER
IS A SAFE WORKER

A-45592



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